

Electromagnetic Theory II: Homework 13

Due: 26 March 2021

1 Reflection and transmission coefficients: normal incidence

The reflection coefficient is

$$R := \frac{I_R}{I_I}$$

where I_R and I_I are the intensities of the reflected and incident waves. Similarly the transmission coefficient is

$$T := \frac{I_T}{I_I}.$$

Consider electromagnetic waves at normal incidence. The index of refraction of a material is

$$n := \frac{c}{v}$$

where v is the speed of electromagnetic waves in that medium.

- a) Express the relationship between the amplitude of the reflected electric field and the incident electric field in terms of the indices of refraction of the two materials.
 - b) Express the relationship between the amplitude of the transmitted electric field and the incident electric field in terms of the indices of refraction of the two materials.
 - c) Use the previous results to obtain exact expressions for the reflection and transmission coefficients.
 - d) Show that $R + T = 1$.
- 2** Griffiths, *Introduction to Electrodynamics*, 4ed, 9.37, page 433. Use the result from Prob 9.36.
- 3** Griffiths, *Introduction to Electrodynamics*, 4ed, 9.38, page 433. Use the result from Prob 9.36.